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Micro-bubbles in liquid crystals

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Previously, the director orientation around the inclusions in liquid crystalline emulsions has been theoretically investigated, and a dependence of the director orientation on the particle size has been found [1]. However, so far the experimental investigations have been limited by the invariability of the inclusion size. We want to break through these limitations and introduce a new technique which allows a continuous variation of the particle size. We use a nematic liquid crystal host into which micrometer-sized gas bubbles are injected. By applying pressure to the system, the diameter of these gas bubbles can be continuously varied by up to a factor of five. When furthermore utilizing the dissolution of gas into the liquid crystal, even smaller bubbles can be obtained. Using this pressure method, the size of the bubbles can be varied, and therefore the director orientation in the surrounding of a single bubble of varying size can be investigated. A transition from a hyperbolic hedgehog configuration to a saturn ring configuration, as predicted theoretically [1], is found when continuously decreasing the particle size.

In addition, a different approach has been performed to induce a transition between director configurations by applying an electric field to the system. This technique also allows the control of the director orientation around the bubbles and can be used to induce transitions between director orientations.

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[1] H.Stark, Eur. Phys. J. B **10**, 311 (1999)

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